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Effect of Organic Manure Rate on the Growth and Yield of Nsukka Yellow Pepper (Capsicum Anuum) Alvan Ikoku Federal College of Education, Owerri Imo State

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Abstract

Field trial was carried out during the early cropping seasons of 2020 at Alvan Ikoku Federal College of Education, Owerri Imo State, Nigeria to evaluate the effects of poultry manure rates (0, 7, 14, 21 t/ha) on growth and yield of Nsukka yellow pepper (Capsicum annum) to examine and identify the effect of poultry manure application rate on the Plant height per plant, Number of branches per plant, Total leaf area per plant, Number of flowers per plant, Number of fruits per plant. A randomized complete block design with three replicates was adopted. Data collected through direct observation and measurements was subjected to analysis of variance (ANOVA). The result shows that there were highly significant differences on yellow pepper performance based on rate of organic manure application. Results showed that increase in poultry manure rate resulted in increase in growth and yield of pepper up to 21t/h. It is therefore recommended that farmers apply 21t/h of poultry manure per hectare for sustainable production of Nsukka yellow pepper.

Keywords: *Organic Manure, Rate, Growth, Yellow Pepper, Yield*

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Background to the Study

Pepper is one of the widely used foods and the most widely grown spice crop in the world. It is ranked third among the world's most important vegetable crops, after tomatoes and onion (Peet, 2006), and considered the first spices to have been used by humans (Hill, Ashrafi and Reyes 2013). It (Capsicum annum L.) belongs to the family Solanaceae a group of crops commonly referred to as perishables (Onwubuya, Okporie and Nenna, 2009). It originated in the Mexico and Central American regions (Purseglove, 1981). In the native habitats, pepper is grown as tender perennials, however, they are grown as annuals in many parts of the world. It is eaten raw in salads, cooked in various ways (Purseglove, 1991) or processed into canned, picked, frozen, fermented, dehydrated or extracted products (Bosland and Votava, 2000). The pepper grown worldwide consists of approximately 22 wild species and five domesticated species. Bell pepper-ataware (*Capsicum frutescens),* cayenne pepper or red pepper sombo and (*Capsicum frutescens*), Atarodo- (*Capsicum annum),* (Bosland and Votava 2000). Capsicum species can be divided into several groups based on fruits/pod characteristics ranging in pungency, colour, shape, intended use, flavour and size, Despite their vast trait differences most cutivars of pepper commercially cultivated in the world belongs to the species Capsicum annum. Nigeria produces 50% of total production in Africa (Adesina, Sanni, Afolabi, and Eleduma, 2014). The varieties commonly produced in Nigeria include; Bird pepper-peppers-ata were *(Capsicum frutescens),* Caynne pepper or pepper. Sombo *(Capsicum frutescens)* Atarodo *(Capsicum annum*). Tatase *(Capsicum annum)* and other landraces which include: Nsukka yellow pepper which is not widely cultivated in most states in the country. This maybe because of its tendency to lose its pungency, aroma and colour in other areas (Uguru,1999), Nsukka yellow pepper has a unique aroma which is not known to exist in any other pepper cultivar (Ezike, 1986). Asogwa (2006) noted that the distinctive aroma of Nsukka yellow pepper enhances its acceptability in the market.

As a result of its nutritive and medicinal values, it is used by the food manufacturing industries for the seasoning of processed food, it is also used by the pharmaceutical industries in the preparation of stimulants and counter instant balms for external application. It adds flavor, colour and pungency to several delicacies. It is a recognized source of vitamin C and E and are high in antioxidants. Yellow pepper is used for preservation of cowpea against attack (Echezona, 2006).

Nigeria agriculture is today characterized by low agricultural productivity due to progressive soil fertility decline over the years. Increase in the use of both organic and inorganic fertilizers and other agro-inputs is necessary to help boost food security. Although the current use of fertilizer in the country is slightly above the average for the sub-sahara Africa (9kg/ha/year). It is far below the target of the Abuja fertilizer declaration of 50kg/ha year by 2015 (Sanginga and Woomer, 2009). The problems to the development of crops are many which include soil fertility decline, lack of agricultural credit, access to good quality viable seed, uncertainty of weather, late onset of rains for planting and water control, for producer (Terpend, Venua, and Stela, 2007). Efforts aimed at obtaining high yield of Nsukka yellow pepper would necessitate the segmentation of nutrients status of the soil to meet the vegetable crop requirement for optimum productivity and maintain soil fertility. Increasing the nutrient status of the soil may

be achieved by boosting the soil nutrient content either with the use organic material such as poultry manure (Nwajiuba and Akinsanmi 2002).

Manure is anything that is added to the soil to increase its fertility for plant growth. Manure can be divided into two classes, organic and inorganic. Organic fertilizers in agriculture contribute to soil fertility by adding organic matter and nutrient such a nitrogen, phosphorus, potassium and calcium etc organic manure are derived from decaying materials of plant and animal origin. Poultry manure is relatively resistant to microbial degradation. It is also very cheap and effective as a good source of nitrogen to sustainable crop production, but its availability remains an important issue due to its bulky nature, while inorganic fertilizer is no longer within the reach of poor resource farmers due to its high cost (Ramhan, 2004). There is a lot of prospect for yellow pepper in south eastern region of Nigeria as indicated by the current market demand and price that it commands and yellow pepper has good production history in South Eastern Nigeria, Nsukka in Enugu state, although it is also cultivated in some parts of Kogi state which share common boundary with Nsukka and yellow pepper been produce by this two people are not enough to meet with the market demand. Soil fertility decline is one of the major problems facing farmers in the world and Nigeria in particular, (Rahman, 2014). Although the causes of food insecurity and poverty are numerous, the decline in soil fertility with resultant effect in decreasing crop yield is severally highlighted and stressed. In Nigeria, the practice of shifting cultivation which was one of the effective methods of overcoming the problem of poor crop yield due to decline in soil fertility has virtually disappeared. This could be linked to increasing population explosion and the stiff competition for land space by other land users (Hatiet, 2009). Poultry manure was chosen in the experiment because of its contribution to the improvement of soil properties. In the case of sandy soil, organic manure helps to bind the soil particles together which help to improve the water holding capacity and organic manure help in the loosing of soil particles in case of heavily clay soil (Rahman, 2014). Therefore, this study aimed at evaluating effect of organic manure rate on the growth and yield of Nsukka yellow pepper (capsicum anuum) Alvan Ikoku Federal College of Education, Owerri Imo State, Nigeria.

Materials and Method

The experiment was carried out in the teaching and research farm of the Department of Agricultural Education, Alvan Ikoku Federal College of Education, Owerri, Imo State. Owerri and lies between latitude 5o14'N – 6o35'N and longitude 6o15'E – 7o25'E. The soil of the area is classified as ultisol. Owerri is located within the lowland humid rainforest vegetation zone of south east Nigeria characterized by bimodal rainfall pattern (Nwajiuba and Onyeneke, 2010). The study was set up as a split plot. The design used for the research was a Randomized Complete Block Design with three replications. Seeds of a popular "Nsukka yellow pepper", obtained from the Agricultural Development Programme (ADP) was used for the experiment. The four (4) treatments replicated three times to give a total of (12) experimental units. the treatments were assigned to the experimental units using table of random numbers. The four (4) rates of well decomposed poultry manure (0, 7, 14, and 21 t/ha) constitutes the treatment which are equivalent to 0, 4.3kg, 8kg, and 12kg/bed. The experimental field was mapped out in a rectangular form with length measuring 12m and the

width 6.30m giving an area of 75.6m^2. The dimension of the plot measure 3.8m and 1.58m giving the area of each bed to be 6.004 m^2. A total of twelve (12) beds made up the plot. a measuring scale was used to convert the tones to kg appropriate for the size of the farm land 158.76kg, 105.84kg, 52.92kg, and 0kg. The Nsukka yellow pepper seedlings of 9 weeks were transplanted after 5 days to enable the soil stabilize, using the planting distance of 2cm. The total number of plants contained in a plot is 72 plants. sample size was 6 plants per ridge. The (6) plants were randomly selected and tagged for easy identification. Data collected were subjected to analysis of variance (Anova).

Results

These consist of the plant height, number of branches per plant, total leaf area, number of flowers per plant and number of fruits per plant.

Tables 1: Physical and chemical properties of the soil before after experiment

S/N	Items	Soil Analysis Before Experiment	Soil Analysis After Experiment
1	Sand %	84.25	82.50
2	Silt%	10.00	11.25
3	Clay%	17.4	17.4
4	Textural class	sandy	sandy
5	Nitrogen	0.021	0.02
6	Phosphorus (mgkg^{-1})	2.20	2.09
7	Potassium (cmol/kg)	0.000	0.000
8	Sodium (cmol/kg)	0.002	0.01
9	Magnesium (cmol/kg)	0.000	0.000
10	Organic carbon %	1.09	1.09
11	Ph (h2^0)	5.09	5.34

As the organic matter content of the soil increases, the performance of pepper is enhanced.

Table 2: Effects of poultry manure rate on the height of the plant

S/N	Treatment block	Ot/ha	7t/ha	14t/ha	21t/ha
1	2 WAP	3.2	4.57	5.97	6.57
2	4 WAP	5.0	6.8	8.2	10.03
3	6 WAP	6.9	8.1	10.60	12.7
4	8 WAP	8.6	10.5	12.4	14.2
5	10 WAP	11.37	12.93	14.5	16.16
6	21 WAP	12.87	14.0	16.7	18.5
7	14WAP	20.3	23.6	27.7	30.5
8	16 WAP	22.0	24.9	29.0	33.2
	TOTAL	90.24	105.4	125.05	141.86
	MEAN	11.28	18.175	15.63	17.73

Sig. Level 0.05	2 WAP	4 WAP	6 WAP	8 WAP	10 WAP	12 WAP	14 WAP	16 WAP
	0.037	.027	.000	.000	.000	.003	.019	.000

As shown in the table 2, the mean of the height of the plant was Significantly influenced ($P<0.05$) by poultry manure. As the manure rate was increasing, the height of the plant was also increasing- the highest in height was produced at 16WAP as shown in the table 2.

Table 3: Effects of poultry manure rate on number of ranches per plant

Treatment block		Ot/ha	7t/ha	14t/ha	21t/ha
1	2 WAP	2.00	2.3	2.7	3.3
2	4 WAP	2.7	3.3	3.3	4.3
3	6 WAP	3.0	4.0	4.3	5.0
4	8 WAP	4.0	4.6	5.0	5.7
5	10 WAP	5.0	6.3	7.0	7.3
6	12 WAP	5.0	6.6	7.3	8.3
7	14WAP	5.0	7.3	8.3	11.0
8	16 WAP	6.3	8.6	9.6	11.5
	TOTAL	33	43	47.5	56.5
	MEAN	4.125	5.37	5.94	7.06

Sig. Level 0.05	2 WAP	4 WAP	6 WAP	8 WAP	10 WAP	12 WAP	14 WAP	16 WAP
	.201	.244	.000	.170	.034	.003	0.000	.000

As shown in the table 3, that there is significant difference on the number of branches of yellow pepper. As the manure rate was increases the number of branches increases.

Table 4: Effects of poultry manure rate on the total leaf area.

S/N	Treatment block	Ot/ha	7t/ha	14t/ha	21t/ha
1	2 WAP	5.9	8.5	10.6	12.4
2	4 WAP	7.1	9.97	12.9	14.4
3	6 WAP	9.3	11.7	14.2	16.0
4	8 WAP	11.4	14.6	15.3	18.64
5	10 WAP	9.2	17.4	18.8	20.8
6	12 WAP	15.2	19.4	21.8	23.6
7	14WAP	15.9	20.3	22.5	24.6
8	16 WAP	18.1	22.0	23.7	26.5
	TOTAL	92.1	123.8	139.8	156.9
	MEAN	11.5	15.5	17.5	19.6

Sig. Level 0.05	2 WAP	4 WAP	6 WAP	8 WAP	10 WAP	12 WAP	14 WAP	16 WAP
	0.024	.000	.000	.000	.000	.000	.000	.000

The mean value of the data presented in the table showed that Tom 4 WAP, poultry manure increased significantly ($P<0.05$) leaf area also increased with the result that the highest manure rate gave the highest mean value.

Table 5: Effects of poultry manure rate on the number of flowers

S/N	Treatment block	Ot/ha	7t/ha	14t/ha	21t/ha
1	8 WAP	2.7	4.3	4.3	6.7
2	10 WAP	5.3	6.7	8.7	11.0
3	12 WAP	5.7	9.0	10,0	12.0
4	14WAP	8.0	14.0	17.3	21.0
5	16 WAP	11.7	16.0	23.0	30.7
	TOTAL	33.4	50.0	63.3	81.4
	MEAN	6.68	10.0	12.7	16.28

Sig. Level 0.05	8 WAP	10 WAP	12 WAP	14 WAP	16 WAP
	.018	.000	.000	.000	.000

The results presented the table 5 above shows that there is significant difference on the number of flowers of yellow pepper. As the manure rate increases the weight increases. The blocks Emended with 21t/ha have the highest flowers.

Table 6: Effects of poultry manure rate on the number of fruits per plant.

S/n	Treatment block	Ot/ha	7t/ha	14t/ha	21t/ha
1	10 WAP	3.7	5.0	7.0	7.7
2	12 WAP	5.3	6.0	8.3	11.0
3	14WAP	6.3	8.3	10.0	13.0
4	16 WAP	11.0	15.7	23.7	30.0
	TOTAL	26.3	35.3	49.0	61.7
	MEAN	6.6	8.8	12.25	15.42

Sig.	Level 0.05	10 WAP	12 WAP	14 WAP	16 WAP
		.000	.000	.000	.000

The response of the fruit of pepper to poultry manure is shown on the table 6 above. There were significant differences on the number of fruits per plant as affected by rates of applied manure. As the plant that receive 21tones of poultry manure had highest number of fruits, while the control (Oton/ha) had the lowest number of fruit.

Discussions

Nsukka yellow pepper growth and yield are assessed using the following indices, the plant height, number of branches per plant, total leaf area, number of flowers per plant and number of fruits per plant. This is possible because there have been programmes involved in multi-disciplinary research projects aimed at improving yellow pepper production so as to meet the social needs, (Grubben and Penton, 2004). Poultry manure application plays an important role in growth and development of yellow pepper. The experimental site was found to be low in nutrient, and as such cannot support full growth of yellow pepper. The application of poultry manure helped to boost the soil nutrient status. It has been observed that poultry manure could augment the nutrient content of the soil (Ayoola, and Adeniran 2006). The differences in the

plant height number of branches per plant, total leaf area, number of flowers per plant and number of fruits, per plant were very highly significant ($p<0.05$) yellow pepper treated with 21tons of poultry manure were significantly highest. The experimental site was discovered to be acidic at pH of 5.32. Therefore, poultry manure application at different rates on other plots seemed to perform better than the control plot. Hence, those that received 21tons of poultry manure had highest leaf area possibly because higher rate of manure improved the nutrient contents of the soil, which in turn enhances leaf area. This is in harmony with the reports of Adekiya and Ojienyi (2002) which attributed increased growth of crop plants to the release of more nutrient elements. It is also in harmony with John (2004) who indicated that poultry manure released essential element which promoted high photosynthetic activities that enhanced the growth of yellow pepper.

Higher number of fruits was produced by the plant that received 21t/ha of poultry manure possibly because the manure establishes and maintained soil physical condition for plant growth, This is consistent with the reports of Lombin, (1991) which indicated that poultry manure is essential for establishing and maintain the optimum soil physical condition for plant growth. There is significant increase in number of branches with the application of poultry manure. The branches of the control plot were small compared to the other plots. This observation corresponds with works of Dauda, (2005), which specified that treatments with 21tons per ha of poultry manure significantly gave higher means value seed weight per plant. This result contradicts with the report of Ojeniyi (2000) that variations in treatment do usually give significant variation on number of branches per plant.

Conclusion

This study was carried out to examine the effect of poultry manure rate on Nsukka yellow pepper production in Alvan Ikoku Federal College of Education, Owerri. It was conducted in Randomized Complete Block Design (RCBD) with three (3) replicates. The rates of manure application in tones per hectare were 0, 7, 14 and 21. The parameter assessed to achieve the objective of the study were plant height, number of branches per plant, total leaf, Area, number of flowers per plant, and number of fruits per plant. The result showed that plants that received 7t, 14t and 21t/ha of poultry manure were superior in parameters tested. As the manure rate was increasing, the performance was positively influenced.

Recommendations

Based on the findings of this research study, the following recommendations are made:

1. Farmers apply 21 tons of poultry manure per hectare to supplement the natural requirement of the plan so as to enhance optimum performance of Nsukka yellow pepper in the area
2. There should be availability of organic manure and when due by diversifying the source of organic manure. This could be achieved through the conversion of biodegradable waste to manure.
3. Investment in the production of organic manure from waste should involve both government and individual participation in order to supply input to farmers at a lower cost.

4. Policy makers should gear policy direction towards utilizing our indigenous resources which have least cost advantage in crop production

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